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The Coal Resources of Canada

BY

M. J. PATTON

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THE COAL RESOURCES OF CANADA

THE sight of long trains of coal laboriously wending their way northward from the Pennsylvania coal-fields to Canada would apparently justify one in the assumption that the northern neighbor of the United States is deficient in coal resources. Nothing, however, could be further from the truth. As a matter of fact, Canada has one-sixth of all the coal in the world—almost as much as the whole continent of Asia, more than Europe, Africa and Oceania, and over one and a half times as much as all the countries of Europe combined. Her coal reserves are second only to those of the United States. It cannot be gainsaid that when coal resources were being given out, nature dealt to her with lavish hand.

And yet Canada imports coal in large quantities. She is peculiarly dependent on the coal-fields of the United States for this commodity, so vital for domestic heating in a rigorous winter climate and so necessary for industrial developments in any country. Why such an anomaly? Why these large imports where there are abundant supplies of coal at home? Canada imports three-fifths of the coal she consumes because her own deposits are located far away from the large coal-consuming centres of population. This great geographic fact lies at the root of what Canadians have come to call their 'fuel problem'. It is cheaper and more convenient to import coal from other countries than to pay for the long haul from their own coal-fields. Canada's fuel problem, in the final analysis, is, therefore, not one of supply but of distribution.

A Country of Great Distances

The significance of these facts cannot be fully appreciated unless we keep in mind several important geographic truths. First of all, it should be remembered that Canada is a very large country. The distance from Halifax on the Atlantic to Vanucouver on the Pacific is 3,600 miles. Her principal coal-fields are in Nova Scotia and in Alberta and British Columbia, on the eastern and western extremities; whereas the manufacturing and commercial provinces of Ontario and Quebec con-

taining three-fifths of the population are centrally located. Toronto, the capital of Ontario, is approximately 1000 miles from the Nova Scotia coal-fields and about 2,000 miles from those of Alberta. And as if this geographic handicap to national self-sufficiency in fuel were not enough, there has been added another. The Ontario peninsula, which is the most highly industrialized section of Canada, is thrust southward almost into the large coal-producing area of the United States, with which it is connected by numerous, well-organized and highly efficient lines of transportation.

Consequently in the matter of freight rates as in that of distance, coal shipped from the adjacent United States to the central provinces of Ontario and Quebec possesses a decided advantage over that from far-off Alberta and Nova Scotia. For instance, the freight rate on coal from Drumheller in Alberta to Toronto is $12.70 a ton for the 2,026-mile haul. For the 356-mile haul from Scranton, Pennsylvania, to Toronto, the rate is $3.96 for anthracite, and for the 280-mile haul from Clearfield, Pennsylvania, it is $3.09 for bituminous. The rate from Springhill, Nova Scotia, to Toronto is $6.50 all rail, for the 1,052-mile haul, and $4.75, water and rail, from Sydney. Rates to Montreal permit competition there between Nova Soctia and United States coals. It costs from $1.00 to $1.25 by water and $3.60 all rail (613 miles) to ship a ton of coal from Sydney, Nova Scotia, to Montreal. From Scranton to Montreal (396 miles) the rate on anthracite is $4.42, whilst the freight rate on bituminous from Clearfield, Pennyslvania, (477 miles) is $4.00. It is not difficult to understand why a large and lucrative trade has been built up between the United States and central Canada in both anthracite and bituminous coal.

Canada Has One-sixth of World's Reserves

I have emphasized the factor of long hauls and high freight rates due to the populous industrialized central Canada being far removed from the coal-fields of Nova Scotia, Alberta and British Columbia, because it is a basic one. Without a clear understanding of its influence, the significance and value of the coal-fields of Canada in providing the nation's fuel supply cannot be properly apprehended. Having given due weight to it we may proceed with our main theme viz., the coal resources of the country. Official estimates by the Geo-

logical Survey place the coal reserves of Canada at 1,229,236 million tons. This compares with 3,838,657 million tons for the United States which has the largest reserves of any nation and is the only country whose reserves exceed those of Canada. Unlike the United States, however, Canada is deficient in anthracite, although, at the present time, small reserves of semi-anthracite are known to exist in Alberta and British Columbia.

Of bituminous and sub-bituminous coals, however, Canada has enormous reserves. . These are located for the most part in the western interior, although there are important fields also on both coasts. On the Atlantic coast, bituminous coals are extensively mined for power production, manufacturing, and for railway and marine transportation purposes, as well as for the reduction of iron ore and for domestic heating. On the Pacific coast, bituminous coals are mined for power production, domestic heating, ship bunkering and for export. The interior of British Columbia produces coking coals, which are used to some extent in the smelting of metal ores. With the exploitation of the abundant undeveloped mineral resources of the province, their use for metallurgical purposes is bound to increase.

The fields of the interior portion of Canada supply coals of various grades, those of the mountain region of eastern British Columbia and western Alberta being the most important and of the highest grade. The extensive coal fields of Alberta, which contain coals of a wide range of character, form Canada's largest and most important coal reserve.

In southern Saskatchewan and in Manitoba, coals of lignitic character are found in large supply. These are well adapted to local domestic use. The coals of the Arctic islands, located as they are in a frigid and little frequented territory, are of little practical value at the present time. Little is known of either their extent or quality. It is, however, interesting to observe that they lie in about the same latitude as the Spitzbergen coals in Europe.

The accompanying table gives a summary of the coal reserves of Canada by provinces as estimated by the Geological Survey of Canada. The actual reserve shown is a computation based on the known coal areas and seams already tested, including the areas being mined. The coal that can be recovered is probably from 50 to 60 per cent of the indicated reserve.

ESTIMATED COAL RESOURCES OF CANADA

District	Actual Reserve (Based on actual thickness and extent) Tons (Metric)	Class of Coal‡	Area (sq. miles)	Probable Reserves* Tons (Metric)	Class of Coal†	Area (sq. miles)
			Group I—*Seams of* 1 *Foot and Over, to a Depth of* 4000 *Feet*			
Nova Scotia	2,137,736,000	B_2	174.31	4,871,817,000	B_2	273.5
	50,415,000	C		20,000,000	C	
New Brunswick	.....	....	.....	151,000,000	B_2	121.0
Ontario	.....	....	.....	25,000,000	D_2	10.0
Manitoba	.....	....	.....	160,000,000	D_2	48.0
Saskatchewan	2,412,000,000	D_2	306.0	57,400,000,000	D_2	13,100.0
	.....	D_2		26,450,000,000	D_2	
	382,500,000,000	D_1		464,821,000,000	D_1	
Alberta	1,197,000,000	B_3	25,300.0	139,161,000,000	B_3	56,375.0
	2,026,800,000	B_2 B_1		43,022,600,000	B_2 B_1	
	669,000,000	A_2		100,000,000	A_2	
	22,666,014,000	A_2 B_2		36,761,867,000	A_2 B_2	
British Columbia	118,000,000	B_3	439.0	2,300,000,000	B_3	5,595.0
	60,000,000	D_2		5,136,000,000	D_1 D_2	
				1,800,000,000	C	
Yukon	.....	....	.....	250,000,000	A_2 B_3	2,840.0
				4,690,000,000	D_1 D_2	
North-west Territories	.....	....	.....	4,800,000,000	D_2	300.0
Arctic Islands	.....	....	.....	6,000,000,000	B_2 B_3 C	6,000.0
Totals	413,816,965,000‡	....	26,219.31	797,920,284,000	....	84,662.5
			Group II—*Seams of* 2 *Feet and Over, at Depths Between* 4000 *and* 6000 *Feet.*			
Nova Scotia (marine areas, 3- to 5-mile limit)				2,639,000,000	B_2	73
Alberta				12,700,000,000	B_2	203
British Columbia				2,160,000,000	B_2	11
Totals				17,499,000,000	....	287
Grand Totals	413,816,965,000		26,219.31	815,419,284,000		84,949.5

*Includes areas in which there are rocks found to be coal-bearing in other localities.

† In the above classification letters have been substituted for names. In a general way the classification conforms to the nomenclature used in America, as follows: A_1—Anthracite; A_2—Semi-anthracite; B_1—Anthracite and high carbon bituminous; B_2—Bituminous; B_3—Low carbon bituminous; C—Cannel; D_1—Lignite or Sub-bituminous; D_2—Lignite.

‡ In this total, 20,000,000 has been deducted or the amount of coal of all classes already extracted in Alberta.

To give even a fairly adequate idea of the coal resources of Canada it will be necessary to deal with the more important coal areas individually. These it is proposed to treat as they occur from west to east. The limits, however, of such an article as this preclude the possibility of describing the various coal-fields in more than a somewhat sketchy and very general fashion, and readers who desire more detailed knowledge should consult the various official publications on the subject.*

British Columbia

The province of British Columbia on the Pacific coast is well supplied with coal measures ranging in quality from lignite to anthracite. The greater part of the deposits are bituminous,' although altered to anthracite in several localities. Coal has been produced and used in the province from the days of early settlement. It is recorded, for instance, that in 1836 the first steam-boat on the Pacific coast, the **Beaver,** used British Columbia coal under her boilers. The mountainous topography of the province has militated against favorable transportation and marketing conditions, as well as being responsible for a considerable area, especially in the north, remaining unexplored and unprospected. The estimated coal reserves of the province are placed by the most competent authorities at approximately 71,000 million tons, of which over four-fifths is classed as bituminous. Details of these reserves are shown in the accompanying table.

Coal Resources of British Columbia

Group I.—Seams of 1 *Foot or Over, to a Depth of* 4,000 *Feet*

Semi-anthracite	1,349,950,000	metric	tons
Anthracitic coal and high carbon bituminous	34,700,000	"	"
Bituminous	58,043,231,000	"	"
Low carbon bituminous	2,418,000,000	"	"
Cannel	1,800,000,000	"	"
Lignitic or sub-bituminous	4,136,000,000	"	"
Lignite	1,060,000,000	"	"

*The publications of the Geological Survey of Canada, of the mines departments of the various provincial governments and of the Canadian Institute of Mining and Metallurgy, to all of which the author acknowledges his indebtedness in the preparation of this article, will be found very useful.

Group 1.—*Seams* 1 *of* 2 *Feet or Over, at Depths Between* 4,000 *and* 6000 *Feet*

Bituminous (southern B. C., 11 sq. mi.)	2,160,000,000	"	"
Total	71,001,881,000	"	"

Although coal measures are widely distributed in British Columbia, the important coal areas are more or less isolated. Commercial production has been confined almost entirely to three fields in the southern and better settled portion of the province. These are the Vancouver Island, the Interior or Nicola-Similkameen and the Crowsnest Pass fields. Less important deposits, of which, however, a great deal has yet to be learned, are in the Liard River, Peace River and Omineca districts and on the Queen Charlotte islands. At the headwaters of the Skeena, Nass and Stikine islands. At the headwaters Columbia there is an important area of anthracite and semi-anthracite known as the Groundhog Mountain district. It is as yet undeveloped, but the area outlined by prospectors comprises nearly 170 square miles.

The estimated reserves of the three important fields of the province are as follows:

Vancouver Island—		
Nanaimo district	286,934,000	tons
Comox "	547,005,000	"
Suquash "	55,000,000	"
Nicola-Similkameen—		
Princeton district	435,200,000	"
Coalmont "	110,636,000	"
Chu-Chua "	54,000,000	"
Crowsnest Pass—		
Crowsnest district	22,000,000,000	tons
Upper Elk "	14,000,000,000	"
Flathead "	600,000	"
Crown Mountain "	200,000	"

Extensive faulting and irregular thickness of the seams, some of which vary from a few inches to over 30 feet in a lateral distance of less than 100 feet, are the main difficulties to be overcome in mining on Vancouver Island. The Nanaimo district's productive area is estimated at approximately 65

square miles. The area of the Suquash district has not yet been estimated with any degree of definiteness. The Nanaimo measures furnish a bituminous coal of fair grade whilst the Comox produces a coking bituminous coal, the highest in fixed carbon content of all the Vancouver Island coals.

The Nicola-Similkameen coal-fields in the southern interior of British Columbia are widely scattered and broken, and the output varies from bituminous to lignite. The Chu-Chua deposits of low-grade bituminous with an estimated area of 5 square miles are located on the North Thompson river some 55 miles north of the city of Kamloops. The coal areas of the Liard river, of which not much is known, are lignitic in character. Fairly extensive deposits ranging from anthracite and semi-anthracite to lignite occur on the Queen Charlotte islands.

The Crowsnest field, situated on the western slope of the Rocky Mountains, in the southern portion of British Columbia, constitutes the largest deposit of first-class coal on the Pacific slope between Alaska and Mexico. It covers an area of 378 square miles and reserves are estimated at 36,800 million tons. Unlike the Vancouver Island and Nicola-Similkameen fields, the Crowsnest is free from extensive faulting, albeit in some places rocky intrusions have broken it into different sections. The coal seams are of great thickness and are regular but the overburden is heavy and mining operations have had to contend with large quantities of methane gas. In several places the coal-bearing rocks are as much as 4,700 feet thick.

Geologically, the coals of this field belong to the Kootenay formation, which persists also on the Alberta side of the provincial boundary. According to Dowling, this formation produces the most valuable coal in Canada. In general, the quality of the coal in the Crowsnest field is a high-grade bituminous, but semi-anthracitic varieties also occur. The majority of the seams furnish a very good coking coal as well as providing an excellent steam fuel.

One of the chief difficulties of the coal trade of British Columbia has been to find markets. The Vancouver Island coals are used for the bunkering of ships, and for domestic heating and industrial uses on the mainland, especially in the city of Vancouver. Some is exported to the United States, as

is also a portion of the output of the Nicola-Similkameen district. The coal from this last-named district competes with the Vancouver Island coals in Vancouver and the coast markets generally, but a considerable portion of it is used for railway purposes. On account of their adaptability to many uses, the Crowsnest coals have a wide market extending from their point of competition to the west with the Nicola-Similkameen coals to as far north as Calgary and as far east as Winnipeg. About three-fifths of the output is exported to the United States. These coals are used for railway fuel, for conversion into coke, for smelting, for domestic heating and for manufacturing purposes. The competition of fuel oil of late years, both on the railways, and for domestic and industrial purposes in Vancouver, has made serious inroads on the markets for British Columbia coals.

Alberta

The province of Alberta is particularly rich in coal deposits the quality of which ranges from semi-anthracite* to lignite. For a distance of over 700 miles from the international boundary northward, the Rocky Mountains and their foothills are studded with deposits of coal. The province contains 17 per cent of the coal resources of the world and approximately 87 per cent of the coal resources of Canada. Reserves, both actual and probable, are estimated at considerably over 1,000,000 million tons.

Coal is found in three distinct horizons or layers, the Edmonton formation, the Belly River formation and the Kootenay formation. The highest-grade and the hardest coals are found in the mountains, a lower grade in the foothills, whilst the extreme eastern portion of the coal-fields on the plains produces lignite.

Coal-fields in the Kootenay formation in Alberta are found on the eastern slope of the Rocky Mountains and in the foothills from near the international boundary northward to beyond the Athabaska river. North of that latitude most of the coal-bearing areas occur in the foothills. The principal districts where coal from this formation is mined, from south to

*This is often popularly called anthracite, but many geologists claim that, strictly speaking, it should be classed as semi-anthracite.

north, are Crowsnest Pass, Banff-Canmore, Brazeau, Mountain Park and Jasper Park. The coal of the Kootenay formation is, in the main, bituminous, but in the Cascade basin it has been altered to semi-anthracite and semi-bituminous, the greatest alterations taking place in the Banff district. This basin, it is estimated, contains 400 million tons of semi-anthracite and 1,200 million tons of semi-bituminous.

The Crowsnest Pass mining district in this province is a continuation of the same field in British Columbia. It extends from the interprovincial boundary to Burmis. The most important mining centres are at Blairmore, Coleman, Bellevue and Hillcrest.

Proceeding northward along the Rockies, the next important field is in the Brazeau district, where a bituminous coal of good coking quality is mined. This coal basin is about 7 miles wide and extends for a distance of 46 miles in a north and south direction between the North Saskatchewan and tbe main Brazeau rivers. The principal mines are at Nordegg.

Farther north is the Mountain Park district, producing a high-grade steam coal, with areas being worked at Cadomin, Luscar and Mountain Park. The Jasper Park district is on the main line of the Canadian National Railway connecting Edmonton and Prince Albert and the principal workings are at Brulé lake. In the Peace River valley, deposits exists which are considered to be of about the same age as the Belly River beds. In the eastern part, only thin seams have been located but, to the west, seams two feet thick have been found.

The Belly River coals, which lie next above those of the Kootenay formation, cover an area of about 16,000 square miles in eastern and southern Alberta. In quality they grade from low-grade bituminous to bituminous. They are widely distributed, the more important deposits mined being located at Lethbridge, Taber, Saunders Creek and Coalspur. South of Coalspur there is so little overburden that mining is carried on by steam shovel.

Coals of the Edmonton formation, which lies above the Belly river formation, also have wide-spread distribution, the available deposits being estimated to cover an area of 52,405 square miles. The principal fields being worked in this formation are Drumheller, Edmonton and Pembina-Wabamun. The character of the coal changes from lignite in the extreme north-

eastern areas to a good coking coal in the foothills area. The Drumheller field produces a high-grade bituminous coal that will stand handling well. From a production standpoint, this field is the most important domestic coal-field in Alberta.

At the present time, the largest market for Alberta coal is found in the Prairie Provinces. Only a relatively small proportion of the output is exported to the adjoining northwestern states. The Alberta fields supply the domestic and industrial needs of Alberta, Saskatchewan, and Manitoba, as well as fuel for railway locomotives throughout these provinces. In Manitoba and especially in Winnipeg, keen competition has been met from United States anthracite and bituminous. During the war, however, Alberta coals practically drove the United States product out of the Winnipeg market, but this advantage, on account of the prolonged labor troubles in the Alberta Mines in the summer of 1924, has been challenged. In this area, the United States coal has the advantage of an old-established and highly-organized industry, as well as favorable transportation rates; for ore boats which would otherwise return empty from Lake Erie ports carry coal on their trip back to the head of the lakes, where it is stored till the autumn grain movement provides a large supply of cars at Fort William and Port Arthur to be loaded with coal on their trip back to the prairies for more grain.

The imperative need of the coal-mining industry in Alberta is wider markets. At the present time there are in the province nearly 400 mines in operation. These are capable of producing from three to four times as much coal as they can sell. Prospective markets are the northwestern United States, the coal bunkering trade for ships at Pacific ports, and the highly industrialized province of Ontario. The lowering of mining and transportation costs are the prime essentials if wider markets are to be gained and held. Unfortunately, coal mining in Alberta has been frequently beset with long-continued labor troubles. Due to a policy of unrestricted leasing of coal lands, mines much in excess of those needed to fill the demand have been opened, with the consequence that those in operation can work only a portion of the year. It has been found that the miners demand a yearly income of approximately $1,700 regardless of how many days in the year they work. The result of this, as well as of the high overhead charges

caused by part time operation, has been a relatively high cost of production. This has militated seriously against the extension of markets.

Lignites of Saskatchewan, Manitoba and Ontario

Lignite is found in Saskatchewan and Manitoba. In the last-mentioned province, small deposits are found in the vicinity of Turtle mountain, while the whole southern portion of Saskatchewan from Manitoba to the Alberta boundary is underlain by this class of fuel. Reserves of lignite in Manitoba are estimated at 160 million tons and in Saskatchewan at 59,812 million tons. The principal deposits occur in the Souris valley in southeastern Saskatchewan and it is from this area that about 90 per cent of the present production is derived. The chief producing centres are Bienfait, Estevan and Roche Percée.

Lignite is a cheap fuel and, although of low-grade, has been found of value to settlers in sparsely settled districts at some distance from railways. It occurs near the surface and consequently the ease of mining has increased its usefulness in this respect. In the Prairie Provinces, it is used largely for domestic heating purposes, but its present market is mainly for the production of power. It is successfully used as a mechanical stoking fuel for steam purposes and its comparative cheapness makes it of value as a source of power in gas plants. As a commercial fuel its value has not yet been fully realized on account of the ease with which better-grade steam coals are obtainable from Alberta.

Carrying a high percentage of moisture (about 33 per cent on the average) it slacks readily on exposure to the air. This prevents storage during the summer months and the mining of it is, therefore, of a highly seasonal character. Experiments conducted by the Dominion, Manitoba and Saskatchewan governments jointly over a period of five years at a cost in excess of a million dollars have not proved successful in perfecting a commercially feasible method of briquetting Saskatchewan lignites.

Ontario is generally referred to as the coal-less province, but, strictly speaking, this is not true. Lignite deposits covering perhaps 10 square miles and having a maximum available tonnage of possibly 25 million tons, exist in the Moose River

basin near James bay on the slope from the height of land. These, although covered by a light overburden, are not, on account of their low grade and their isolated location, of present economic value.

New Brunswick

New Brunswick has but meagre coal resources. Two thin seams exist, the upper averaging about 22 inches in thickness, whilst the lower seldom exceeds 10 inches. The principal mining districts are Grand Lake, Beersville and Dunsinane. The total reserves are estimated at approximately 151 million tons. The coal is bituminous and contains in places a high percentage of sulphur and ash. Some shipments have been made during the last few years to central Canada. The output of the province is not capable of large expansion since the deposits are limited and the seams are thin.

The estimated coal reserves of Nova Scotia are 9,719 million tons, or less than 1 per cent of the reserves for all Canada. This proportion, however, is not a true index of their importance. Because of geographical conditions they are of much greater value than such a comparison would indicate. Their distance from other coal-fields, their proximity to large deposits of iron ore, their nearness to important centres of population, and their location on the seaboard, as well as the uniform and good quality of the coal produced combine to give them an economic significance that their extent alone would not justify.

The province has the only coal deposits on the whole Atlantic seaboard of North America and South America. The nearest coal-fields in the United States are some 800 miles away and, barring the small Grand Lake field in New Brunswick, there are no coal deposits in Canada nearer than Alberta, a distance of over 2,000 miles. The Nova Scotia fields are, moreover, located at the entrance to the St. Lawrence waterway and cheap water transportation facilities are thus afforded into the centre of Canada, resulting in a large coal trade being built up to serve the territory as far east as Montreal. The proposed deepening of the St. Lawrence canal system will probably enable Nova Scotia coal to compete seriously with United States bituminous in western Ontario markets. Finally, the nearness of the immense Wabana iron ore deposit in New-

foundland just across Cabot strait from the Cape Breton coalfield has provided that unique combination of coal and iron which has so often spelled industrial supremacy for nations. Canada's largest industrial concern, the British Empire Steel Corporation, has been based upon this foundation. Strategically placed both as regards raw materials and in respect to water transportation to world markets, it posses a heritage, the full significance of which has not yet begun to be realized.

There are five coal areas in Nova Scotia with important collieries operating in all. These areas are the Cumberland field including the Joggins and Springhill areas, the Pictou fields, the Inverness (mainly submarine), the Richmond and the Cape Breton or Sydney fields containing both land and submarine mining areas. The accompanying table gives the estimated amount of coal in these fields with an indication of its quality.

ESTIMATED COAL RESOURCES OF NOVA SCOTIA

District	Actual Reserve (Based on actual thickness and extent) Tons (Metric)	Class of Coal‡	Area (sq. miles)	Approximate Probable Reserves Tons Metric	Class of Coal	Area (sq. miles)
		Group 1—*Seams of* 1 *Foot or Over, to a Depth of* 4,000 *Feet*				
Cumberland county	682,000,000	B_2	60	250,000,000	B	5
Colchester	.....	....	..	1,000,000	B_2	1
	345,550,000	B_2	11	450,000,000	B_2	8
Pictou	45,000,000	C				
Antigonish	.....	....	..	20,000,000	C	1
Richmond	.....	....	..	12,360,000	B_2	4
(submarine area)	86,000,000	B_2	4	22,000,000	B_2	10
Inverness (land area)	61,800,000	B_2	5.75	73,000,000	B_2	7
C. Breton county, l. a.	1,022,496,000	B_2		.....	....	..
	5,415,000	C	92.66			
Marine, 3-mile limit	.....	....	..	4,063,457,000	B_2	168.5
Totals	2,248,151,000	....	74.31	4,063,457,000	....	273.5
Less amount mined	60,000,000	....	..	.....	....	..
	2,188,151,000					
	Group II —*Seams of* 2 *Feet and Over, at Depths Between* 4,000 *and* 6,000 *Feet.*					
Cape Breton County—Marine, 3 to 5 miles				2,639,000,000	B_2	73

The coal is of the bituminous class. The principal difference between the coals of Sydney and Pictou is a slightly higher ash content in the latter, although the former has a higher percentage of sulphur. The Springhill coal is low in sulphur and is cleaner than the Sydney coals. They are all steam or coking coals and make a strong metallurgical coke.

The Nova Scotia mines supply the domestic fuel and industrial needs of the province, although even here, despite the handicap of distance, some United States coal finds sale. Normally, over 50 per cent of the output is consumed locally in the iron and steel industry. One of the main outlets is the St. Lawrence market, which, as previously mentioned, is served by cheap water transportation. The closing of the St. Lawrence river by ice in the winter makes it necessary to ship large reserves during the summer to meet the winter demand.

In 1914 over 2,600,000 tons of Nova Scotia coal were marketed in the province of Quebec, but, on account of the disorganization of the trade caused by the war, this market was almost entirely lost. It is being steadily recovered, however, and at the present time absorbs from 25 to 30 per cent of the output, shipments being made mostly from the Cape Breton collieries.

The securing of a place in the markets of central Canada by Nova Scotia coal is entirely a matter of price in competition with the well-organized bituminous coal industry of the United States. Frequent labor disputes have increased the cost of production in Nova Scotia as in Alberta, whilst the high cost of submarine mining as reserves are depleted is another factor which conduces toward rising costs. One authority gives it as his opinion that it is not probable that the coal deposits of Nova Scotia can be usefully or advisedly developed to produce more than 10,000,000 tons annually.* Taking this as a criterion and considering the fact that in 1913, the year of maximum production, the output was 7,263,000 tons, it can be seen that there is not a large margin for expansion. Some allowance must, of course, be made in the contrary direction for the discovery of new deposits, the installation of modern machinery, and the adoption of more efficient methods of mining the seams which are known to extend long distances under the sea.

*F. W. Gray, in *Bulletin of Canadian Institute of Mining and Metallurgy*, October, 1922.

The Problem of the 'Acute Fuel Area'

It is still a debatable question whether Canada can supply the coal-less provinces of Ontario and Quebec with fuel from her own mines. Indeed it is not altogether a foregone conclusion that such a consummation is economically desirable. The problem is not so difficult as regards fuel for industrial purposes as it is in the case of fuel for domestic heating. Nevertheless the bituminous consumption of central Canada for the 5-year period ending 1923 averaged 11,000,000 tons a year out of an annual average of 14,000,000 tons of this class of coal imported into the whole country. One factor is that this area is abundantly supplied with water-powers, which are being rapidly developed to replace fuel for industrial purposes. For domestic heating, however, central Canada, especially Ontario, is markedly dependent on the United States. Its anthracite imports in the period above-mentioned averaged 4,000,000 tons a year as compared with an average of 4,500,000 tons annually for all Canada. Moreover, the coal-consuming public of Ontario have become so prejudiced in favor of anthracite that it has been a matter of some difficulty to secure a fair trial for substitutes. But constantly recurring interruptions in the anthracite supply, due to labor troubles and transportation tie-ups, together with the increasing price and the deteriorating quality of this fuel are having their effect, and a serious effort is now being made to encourage the use of substitutes and to develop a measure, at least, of national self-sufficiency in fuel.

The Dominion Fuel Board

This effort was officially sanctioned when the Dominion Government in 1922 formed the Dominion Fuel Board. This is a permanent body of departmental administrative and technical experts whose function is to study the fuel resources of the country with a view of making Canada as independent as possible of foreign sources of supply. Among its numerous activities have been investigations of central heating, by-product coke as a domestic fuel, efficiency in fuel utilization, the possibilities of the use of low-volatile coals for domestic heating, and insulation of houses, as well as a survey of the extent to which anthracite substitutes are being used. The coal resources of the country are being studied with a special view of

alleviating the condition of the 'acute fuel area', as it is aptly termed, of Ontario and Quebec. The Board has given encouragement, although such aid has been only of a moral and sentimental character, to the importation of Welsh anthracite and, largely as a result, considerable quantities of this high-grade fuel have been imported and extensive grading and screening plants have been erected in Montral. It has also been charged with the administration of the subvention (not exceeding 50c a ton) recently granted by the Dominion Government to coal shipped from the Maritime Provinces to points in Ontario and Quebec where competition exists with United States coal.

A Transportation Experiment

To supply the 'acute fuel area" presents, of course, the major problem to be solved. How can the populous area of Ontario and Quebec be rendered reasonably independent of the dwindling supply of high-cost United States anthracite? In 1923 a strong effort sponsored by the Dominion Fuel Board was made to import trial shipments of Alberta coal into Ontario. Sir Henry Thornton, President of the Canadian National Railways, made the experiment of reducing the freight rate from $12.70 to $9.00 a ton for train-load lots shipped in the summer months before the heavy grain movement began. Under this arrangement some 50,000 tons of Alberta domestic coal were brought into Ontario. With its free-burning qualities, its low ash content, and its comparative freedom from the smoke so characteristic of most bituminous coals, it proved very satisfactory fuel for Ontario householders. The low freight rate, however, was conditional on the cost at the mine being reduced, and unfortunately labor troubles in 1924 prevented such reduction. Indeed they made impossible a supply at any price. When all is said, however, it must be recognized that distance is a very serious handicap to Alberta coal in competing for the Ontario market.

Conceding the point that the Nova Scotia fields could supply a large demand from central Canada, it is doubtful whether they could compete successfully in Ontario with United States coal until the St. Lawrence waterway has been improved to permit the passage of larger boats. As Nova Scotia coals are of the smoky variety, they would not be a

factor in the solution of the domestic heating problem unless converted into coke. Many of them are somewhat high in sulphur for this purpose, but it is thought that by blending them with higher grade coking coal from the United States they might be utilized. Several experiments of this kind have recently been made under the auspices of the Dominion Fuel Board.

A Promising New Fuel

Possibly the most promising new fuel for the acute fuel area is domestic coke made from bituminous coal obtained either from the United States or Nova Scotia or from both. Although the limits of the United States anthracite fields are in sight, this is not true of the bituminous areas. The reserves of these are described as practically inxehaustible. The mines now have an annual capacity of 300,000,000 tons in excess of the needs of the United States. This bituminous coal can be used in Ontario and Quebec to produce gas for the large cities and supply coke for domestic heating, as well as producing various other by-products such as tar and ammonia. By-product coke is a comparatively new fuel for Canadians, although it has been manufactured for some years (mainly for metallurgical purposes) in Nova Scotia. In 1924 a plant of the most modern type was erected in Hamilton, Ontario, and is securing a ready market for its output.

It is a somewhat singular circumstance that the burden of all discussion on Canada's fuel problem has been the desirability of bringing the country's large natural resources in coal from the west and from the east to the thickly populated central area. Little or no attention has apparently been given to the reverse process, namely, the bringing of population to the coal areas. And yet, why not? Economic history teaches us that large coal resources, especially when other minerals are near by, have always acted as a magnet for population. The coal areas of Nova Scotia, Alberta and British Columbia with valuable metallic mineral areas adjacent, are favored with a healthful climate; whilst conditions exceedingly suitable to agricultural pursuits prevail in the surrounding territory. When such a movement of population will begin is, of course, idle to prophesy, but to deny that it will take place some day would be to ignore the ex-

periences of the past. When Canada's coal areas are industrialized, she will have begun to realize on the tremendous national asset she possesses in her one-sixth share of the coal resources of the world.

M. J. PATTON,
Economist, Natural Resources
Intelligence Service.

Ottawa, Nov. 1, 1924.

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